Light and Lighting

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"Seeing is Believing"

MR. R. O. Ackerley adopted this phrase as the title of his Presidential Address in 1942—implying that people are much more likely to believe in the benefits of good lighting if these benefits are *shown* to them than if they are merely told about them.

Two events illustrate this aptly, the demonstrations given to science masters at the very successful joint I.E.S.—S.M.A. meeting on April 18 (p. 68), and the popular lectures on the Wonders of Lighting, given to over 1,000 school children in Bradford last Christmas (p. 72).

It is, of course, easier to illustrate the marvels of light production or well-defined scientific facts than it is to demonstrate, quickly and convincingly, the benefits of good lighting.

Some of these benefits are only realisable over a long period and are not easily demonstrated to an audience. But certain benefits—such as easier and more complete seeing—can be shown, though a good deal remains to be done in scheming effects so as to render them evident and unmistakable.

I.E.S. Annual Meeting

With the holding of its annual meeting on May 9 the I.E.S. concluded yet another successful session. The Annual Report for 1943 makes encouraging reading. The number of new members added to the list (243) was almost as great as in the previous year and must be considered phenomenal in such times as these. This increase is largely due to the development of new Centres and Groups (three new Groups in Derby, Huddersfield, and Stockton-on-Tees were reported), which has now led to the realisation of the projected plan of "organisation by areas." Even more gratifying than increase in numbers, however, is the evidence of growing activity and influence. The Society is leaving its mark on lighting plans for the future, as exemplified by codes of practice, etc., and there have been several enterprising new developments, such as the essay competitions in Birmingham and the Christmas lectures for school children given by Mr. Ackerley in Bradford. The President, in surveying progress, drew attention to the issue of the Lighting Reconstruction Pamphlets, mentioned in our last issue (April, 1944, p. 52). On the financial side, also, the position must appear encouraging, as the income of the Society and, what is even more important, the surplus of income over expenditure have increased steadily during recent years. Members, however, will take note of the President's warning that the Society will have to face increased expenditure in the development of its administrative machinery in the future, especially when the plans for increased post-war activities are carried into effect. Following the transaction of formal business the usual Sessional Meeting was held. The address was given this year by Sir Charles Darwin, Director of the National Physical Laboratory, who took for his subject, "Tolerances and their Effect on Physical Measurements." The happy way in which this somewhat abstruse topic was presented made it interesting to everyone, and the acclamation with which the vote of thanks to Sir Charles was carried should encourage future enterprise in arranging similar lectures somewhat off the beaten track.

Psychophysics and Photometry

In the course of the meeting referred to above the Hon. Secretary conveyed an invitation to I.E.S. members to attend a meeting of the Royal Photographic Society (to be held at 6 p.m., at Prince's Gate, Kensington, on May 30) to hear a paper by Dr. L. A. Jones on the above subject. This somewhat formidable title embraces discussion of contrast sensitivity, sensation-stimulus relationships, and other factors influencing vision which are of definite interest to illuminating engineers. We hope to make some reference to the paper in a coming issue.

Leicester Demonstration Centre and Home for I.E.S. Group

One drawback under which most I.E.S. Centres and Groups have been suffering is that whilst they have all been duly credited with "a name," they do not, in general, possess the "local habitation" which should go with it—in other words, they have no home or premises of their own. As I.E.S. members are aware, their headquarters in London is none too well equipped in this respect, but it has at least an office, a library which can be consulted, and a room in which committee meetings are held almost continuously during the session. Centres and Groups have, in general, nothing similar; some of them would like to assemble small local libraries, but have no place to store them, nowhere even where the I.E.S. Transactions of the societies in Great Britain and America can be placed in custody. We gather, however, that the problem has been very happily solved by the Leicester Group, which has been granted the use of three rooms in the Corporation's Lighting Department at Rutland-street, at a nominal rent of 1s. per annum, and on condition that the costs of lighting and heating are met by the Society. The rooms are not to be used for advertisement purposes, but they are intended to serve in part as a demonstration centre. For this welcome arrangement the Society is indebted to one of its leading members in Leicester, Mr. Thomas Wilkie, the public lighting engineer.

I.E.S. Meeting in Halifax

It is a good feature that I.E.S. meetings are now quite frequently held in places where, as yet, no formal Centre or Group exists. We learn that a very successful meeting of this kind was held in Halifax on May 9, when Mr. E. D. Jones, of the B.T.H. Research Laboratories, gave an address on "Fluorescent Lighting; the Trend of Development." The lecturer emphasised the important part which fluorescent lighting would play in post-war lighting, but referred to various technical problems still to be overcome. We understand that nearly sixty people were present and that the audience much appreciated the address—only breaking up at 8.30 p.m. in order to catch their buses. The chair was taken by Mr. Elson, of the Halifax Electricity Department, in whose showrooms the meeting was held. It is hoped to arrange further meetings in the autumn.

Position Vacant

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Forthcoming I.E.S. Meeting

June 6th. Mr. J. W. Howell on **Lighting in Industry.** *(Meeting of the Leicester Group, to be held in the Leicester Corporation Electricity Department, Demonstration Theatre, Charles Street, Leicester.)* **6 p.m.**

Experiments With Light

I.E.S. Joint Meeting with the Science Masters Association on April 18

The Illuminating Engineering Society has been particularly fortunate in its joint meetings during the past session. One of the most successful was undoubtedly that held at the Imperial College of Science (South Kensington) on April 18, when I.E.S. members forgathered with members of the Science Masters Association, who rolled up in great strength—the audience more than filled the large Physics Theatre and can hardly have been fewer than 300.

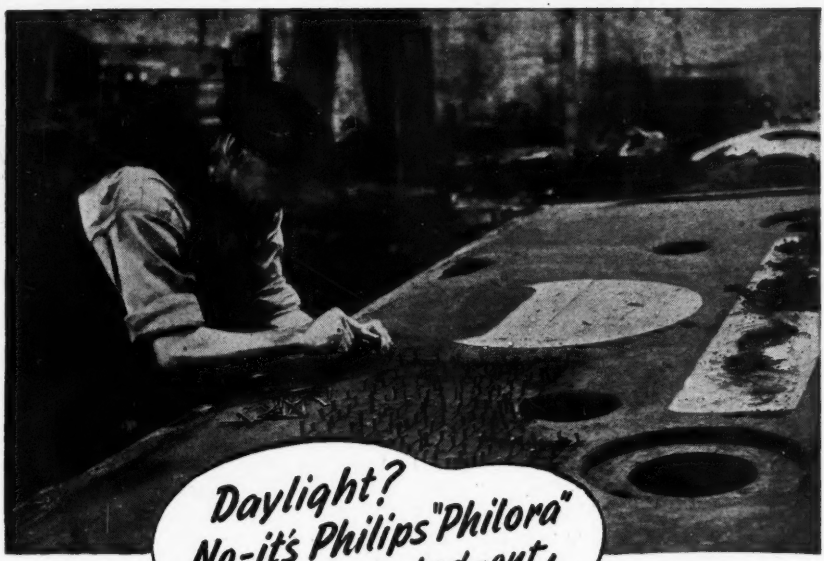
In the course of the afternoon, whilst an I.E.S. Council meeting was taking place elsewhere in the College, the Science Masters had an informal gathering of their own in the Refectory, where all assembled for tea at 4.30 p.m. [To provide for such a large number in present circumstances was certainly a feat.]

When the stage was set for the sessional meeting at 5 p.m. the President (Dr. H. Buckley) welcomed members of the S.M.A., several of whose leading members were on the platform. Dr. W. D. Wright, who has supervised the arrangement of the various demonstrations, then gave a short address, after which the demonstrations began. We reproduce below a list of these experiments which, whilst primarily intended for the science masters, should be useful to I.E.S. members as a record. (A fuller account of them will appear in the I.E.S. Transactions in due course.)

1. THE PRODUCTION OF LIGHT. (By Mr. L. T. Minchin and Mr. J. B. S. Smyth.)
   (a) By heating—examples of sources at different temperatures, including catalytic action employed in gas mantles. (b) By gas discharge. (c) By fluorescence.
2. THE NATURE OF LIGHT. (By Mr. J. S. Preston.)
   (a) Projection of spectrum—effect of recombining various strips of spectrum. (b) Effect of absorption in filter—distinction between additive and subtractive mixture. (c) Distinction between continuous and line spectra.
3. THE EYE. (By Dr. W. D. Wright.)
   (a) Model and Demonstration to show similarity between eye and camera. (b) Model and experiment to show difference between eye and camera—eye movements, muscular control, variation in resolving power across retina.
4. PHOTOMETRIC PRINCIPLES. (By Professor J. T. MacGregor-Morris.)
   (a) Inverse square law for point sources; extension to large area sources and multiple sources as in an actual installation. (b) Relation between illumination and brightness of a surface, including cosine law and interplay of specular and diffuse components of reflected light.
5. THE BENEFITS OF GOOD LIGHTING. (By Mr. R. O. Ackerley.)
   (a) Demonstration to show you cannot tell whether you are seeing all there is to see. (b) Effect of increased illumination on ability to see small detail. (c) Effect of increased illumination on ability to see moving objects. (d) Importance of shadows in revealing shape. (e) Effect of increased illumination to apparent contrast. (f) Effect of glare.

The experiments were all skilfully performed. Perhaps Mr. Preston's slick demonstrations with coloured light were particularly applauded—the audience was impressed by the ingenious method of mixing by superimposing portions of spectra one over another—but all were admired. Professor J. T. MacGregor-Morris skilfully contrived his demonstration with a panel of fluorescent tubes to show the distances at which conditions of radiation from a point, a line, and a surface were exemplified and tested it out on the spot. Dr. Wright's models illustrating the behaviour of the eye also excited interest, and Mr. Ackerley's final display, based mainly on the demonstrations which accompanied his Presidential Address on "Seeing is Believing," went down as well as usual.

There was a good discussion in which members of the S.M.A., Mr. Savage (of the L.C.C. Education Dept.), Mr. G. H. Wilson (who has the unique distinction of being a member of both bodies), and others, took part. Votes of thanks to Dr. Wright, the Imperial College of Science, and the demonstrators were carried with acclamation. Finally, Mr. W. Ashurst, on behalf of the S.M.A., expressed their pleasure at being invited to share in this joint gathering.



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Electric Lighting:

A Contractor's Standpoint

Summary of an Address delivered by Mr. J. Ashmore, M.I.E.E., to the I.E.S., Birmingham Centre, on January 28, 1944

The status of the electric lighting contractor has changed with the evolution of electric lighting. In the early days the inventor or discoverer of a new lamp was necessarily the contractor—because he was the only person that knew anything about the system. But as electric lighting became familiar, the number and size of installations increased, a trade developed, and retailers of electric lamps and accessories came into existence. Contracting for installations thus came into the hands of practical men, some having technical skill but others without it.

For many years this phase continued, but when science entered the field and the effects of light were more closely studied, contractors were confronted with the fact that there was more to be done than merely hanging up lanterns.

In order to illustrate how the complexity of lighting has developed, Mr. Ashmore gave a brief review of the progress of artificial lighting from early days, making a very apt quotation from Professor Silvanus P. Thompson's lecture to the British Association in 1906 when he emphasised the possibilities of luminescence, and concluded by remarking: "He who will invent a lamp giving light without heat will make all his lamps a hundred times brighter than lamps now are." The modern fluorescent lamp is the answer. The filament lamp has advanced from 3.5 lumens per watt in 1897 to 20 lumens. With the fluorescent lamp 40 lumens per watt is available, and up to 70 lumens per watt is said to have been attained in America, where in 1943 the life of such lamps was reported to reach 5,000 hours—five times the life of the filament lamp in 1897! Mr. Ashmore presented an interesting record of steps in lighting progress from Sir Humphry Davy's experiments with the electric arc in 1800 up to the fluorescent lamp of today. He gave particulars of early installations of arc and incandescent lamps from 1857 to 1891, and the names of the contractors.

Turning to technical aspects, Mr. Ashmore drew attention to the differences between natural and artificial light and between conditions characteristic of direct and indirect lighting. In regard to the designing of installations, he quoted the saying of the late Miles Walker: "The great art is to know what to calculate and what to guess." He reviewed, however, the data available as exemplified by the I.E.S. Code and the "lumen method" of calculation, but he emphasised, by the aid of many illustrations, how the effect of the light must be studied, as well as the illumination secured—drawing attention to such matters as the effect of shadows, the switching of lamps and the planning of pilot lighting. One important point, illustrated by a useful graph, is the progressive increase in the weight of fittings per square foot of ceiling with increasing illumination.

A final section on "Carrying out the Works" contains some useful hints on the purchase and storage of materials and on the procedure to be adopted when the contractor has actually established himself on the premises to be lighted.

[*Mr. Ashmore has kindly presented the Society with a complete and fully illustrated bound copy of this paper which is open to inspection by any I.E.S. member calling at headquarters.* —Ed.]

What is Ballotini?

Is she from Sadler's Wells or is it a Soho dish? Neither: 'Ballotini' are actually tiny glass balls, varying up to a quarter of an inch in diameter. The smallest ones, which look like salt, are used as reflectors and employed in large quantities for the facing of cinema screens. The bigger ones have a more serious job to do — they are used for the storage of plasma for blood transfusion. These are only two of the surprising ways in which specialised glassware is meeting current needs. Our Research Department is finding others and collaborates with those manufacturers who are curious about what glass can do.

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The Wonders of Lighting

Four Christmas Lectures delivered to Bradford Secondary School students by Mr. R. O. Ackerley on December 29 and 30, 1943.

Some time ago we gave a brief preliminary account of the Christmas lectures, delivered by Mr. Ackerley in Bradford last year. Some fuller information has since reached us and is included in what follows. It is hoped that this somewhat belated account will prove of service to other I.E.S. Centres and Groups desirous of taking similar action in the future.

The Origin of the Idea

The idea seems to have arisen as a result of Mr. Ackerley's Presidential Address, in which schools and colleges were mentioned as suitable "Targets for Conversation" in connection with lighting. Mr. W. H. Naylor, the Chairman of the I.E.S., Bradford Group, and his committee determined to try to exploit this suggestion. An interview was eventually arranged with Mr. T. Boyce, the local Director of Education, who warmly approved the project. The Bradford Group was fortunate in obtaining from Mr. T. H. Carr, the City Electrical Engineer and Manager, permission to use the Electricity Department Lecture Theatre—a most valuable concession. This lecture room seats about 250. There are, however, as many as 6,500 names of students on the register of the thirteen secondary schools in Bradford. It was thought that, in view of the lectures taking place in the holiday season, an attendance of about 10 per cent. might be expected. Actually it reached over 1,000.

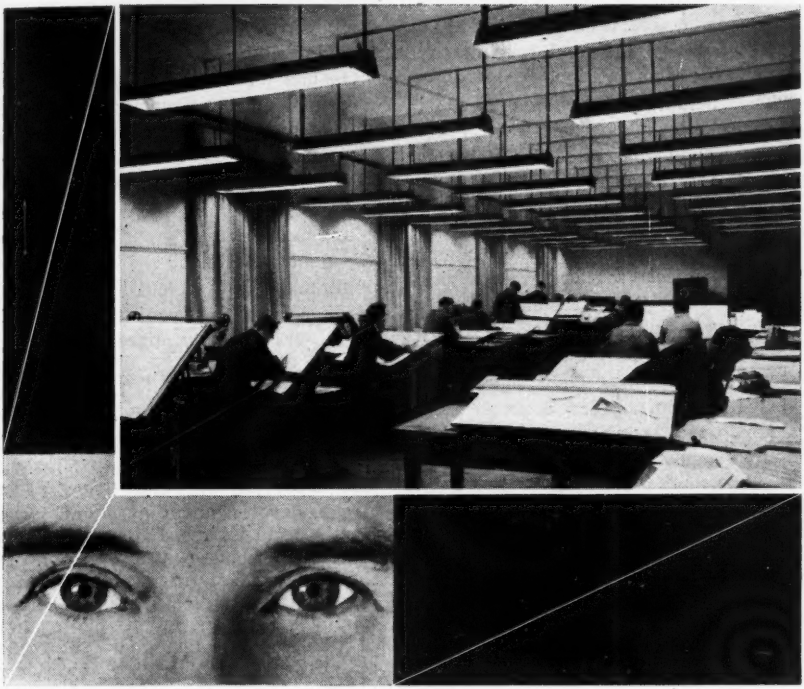
Distribution of Leaflets

Mr. Ackerley having kindly consented to give the lectures, a leaflet giving a synopsis and mentioning four alternative times (i.e., 10 a.m. and 3 p.m., on December 29 and 30) was printed and circulated. The leaflet contained a detachable slip for applicants to record which lecture they desired to attend. Over 1,200 applications, from twelve out of the thirteen schools, were received. [Contact with one school, owing to absence of staff and other difficulties, could not be arranged.] Owing to this large response the original lecture plan had to be modified, three lectures on each day (at 11 a.m., 2 p.m., and 4.15 p.m.), i.e., six in all, being substituted. Admission cards in distinctive colours were then printed and distributed through the staffs of the schools, whose help in connection with this effort was invaluable. Others also helped—for example the Parks Department decorated the room in a seasonable manner, and a local store loaned a record-player to entertain audiences during the period of waiting. Alderman T. I. Clough, Chairman of the City Education Committee; Councillor E. Vincent Heaton, Deputy Chairman of the Electricity Committee; Councillor W. Collins, and Mr. A. Kelson (Chairman of the Leeds Centre) were amongst those who attended. There were also nearly 100 teachers and other adults, resulting in an estimated attendance at the six lectures of 1,154.

An enterprising feature was the presentation, to each person present, of a

Courtesy: Telegraph and Argus, Bradford

Bradford Secondary School boys examining apparatus shown by Mr. R. O. Ackerley in his Christmas Lectures on "The Wonders of Lighting."



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card entitled "Things to remember about your Lighting," illustrated by thumbnail sketches, and serving as a memento of the occasion.

The actual lectures, delivered in Mr. Ackerley's characteristic, breezy manner, and illustrated by numerous experiments efficiently worked by Mr. W. R. Stevens, went with a swing.

Subject Matter of Lectures

The subject matter was divided broadly into three sections, devoted respectively to "Light Sources," "The Eye" and "Lighting and Seeing." The section dealing with light sources was very fully illustrated. Reference was made to the dark days of pine torches and oil lamps, specimens of which were on view, and the children were asked how they would like to do their home work by the light of one of them! Subsequent exhibits dealt with the coming of gas lighting and the development of electric lamps (tungsten filament, sodium, and mercury) up to the present day. The final development, the 5-ft. fluorescent lamp, was illustrated by the familiar exhibit of a lamp half coated with fluorescent material, as well as a collection of lamps giving light of various colours. Effects of ultra-violet light, needless to say, furnished numerous interesting effects. It was shown how the ultra-violet light is checked by ordinary glass, and how cards and other objects painted with fluorescent materials could be made to glow in varied colours when irradiated.

Mr. Ackerley next illustrated, by models and lantern slides, the analogy between the eye and the camera—pointing out, however, that the eye, unlike a camera, cannot be replaced if it is lost, and therefore deserve every care and attention.

For the final section of the lecture Mr. Ackerley relied largely on the devices used so effectively in connection with his Presidential Address on "Seeing is Believing," showing how, with higher illuminations, smaller type becomes readable, and how detail in line drawings, invisible in a weaker light, can be seen, and how adjacent glare makes it more difficult to see such detail. He also showed the familiar experiment with the rotating disc, which appears to travel more quickly when the illumination is low—an experiment by which his young audience was greatly entertained. His final experiment showed the effect of direction of light on the appearance of objects, and the "conjuring trick with eggs" was specially appreciated.

Suggestions for the Future

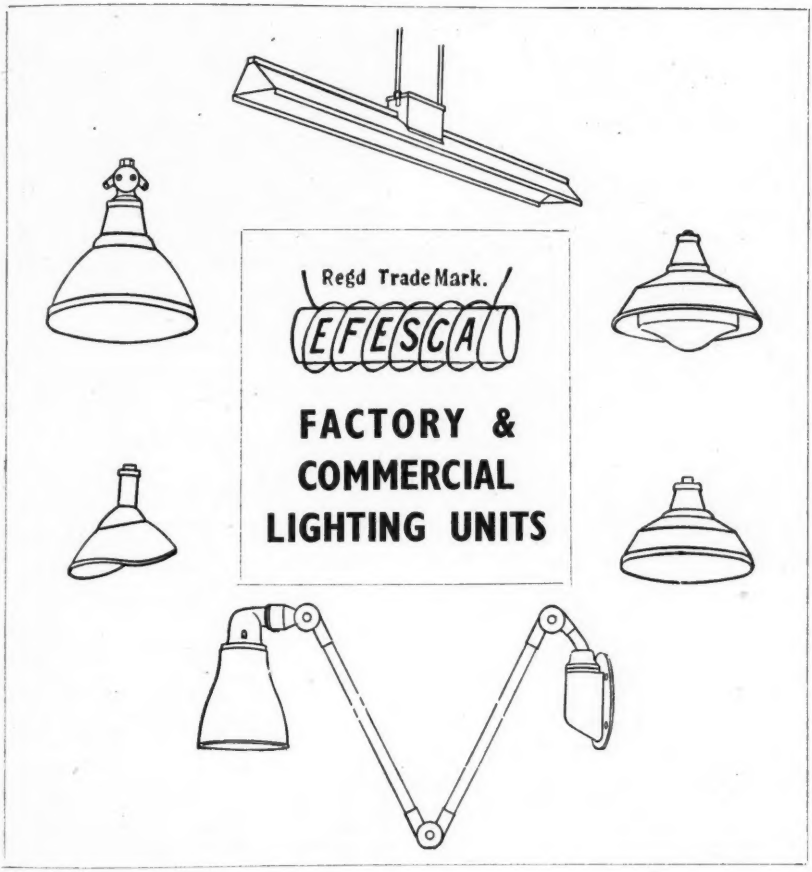
There can be no doubt that the lectures proved a great success and attracted a great deal of interest locally. The local paper, the *Telegraph and Argus*, devoted about a column to the event, and published the photograph reproduced above. The experience of the Bradford Group should be helpful to others attempting to repeat this entertaining experiment. With the goodwill of the local educational and other authorities certain rather formidable expenses, such as those involved in the hiring of halls and the distribution of literature, can be avoided. The printing of leaflets to children, cards and "mementos," very skilfully arranged in this instance, is also an expense of some moment—though in this connection the spade work already done should be helpful to other efforts.

Mr. Hutchison, the honorary secretary of the Bradford Group, to whom we are indebted for most of the above information, suggests that the following points might well be considered:—

(a) The issue of leaflets at a much earlier date—in this case the time available was inevitably rather short;

(b) The question whether it is advisable to have *two* lectures; one for students aged 12-15 years, and the other for those of somewhat more mature age; and

(c) The extension of invitations to students of local technical colleges if the "senior" alternative lecture is adopted.



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Electric Lighting and Post-War Developments

Speeches at the Luncheon arranged by the Electric Lamp Manufacturers' Association of Great Britain, Ltd., at the Savoy Hotel (London), on May 3rd, 1944.

There was a representative and distinguished gathering at the luncheon mentioned above, at which Lord Woolton, Minister of Reconstruction, was the principal guest. Among others present were Lord Portal, Minister of Works, and Major Gwilym Lloyd-George, Minister of Fuel and Power.

After the usual loyal toast, Mr. Charles F. Dickson, Chairman of the the Electric Lamp Manufacturers' Association, called upon Dr. C. C. Paterson to give a demonstration of developments in electrical lighting from early days up to the present time.

Dr. Paterson recalled that the original 60-watt carbon filament lamp gave three units of light for each unit of electric power. Subsequently, tantalum filament lamps gave six units of light, tungsten filament lamps nine units of light, the gas-filled lamps eleven units, and the coiled coil filament lamps twelve units for one unit of electric power—400 per cent. more light than the original carbon lamp.

This lead to a demonstration of the tubular fluorescent lamp, the result of research initiated in this country about ten years ago. Dr. Paterson explained that these lamps give three times as much light for a unit of electric power as the most efficient filament lamp—another great advance. Dr. Paterson explained the nature of the lamp showing the familiar experiment with a mercury tube, half of which was coated with fluorescent material, and also a display of lamps giving different qualities of daylight and coloured light in great variety. Although, in this country, they have necessarily been used almost exclusively in war factories (where they the estimated to be saving coal to the amount of 200,000 tons per annum), they should play a large part in post-war lighting, not only in industrial, office, and public buildings but also in our homes.

In foreseeing future developments, Dr. Paterson emphasised the close match between the colour of their light and daylight, which should lead to their being widely used to supplement natural light during the day time, as well as by night. The general use of millions of such lamps in the homes of the people would involve a big problem of mass production.

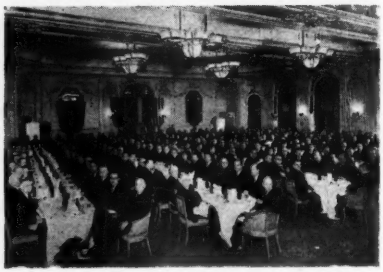

Fig. 1. A General View of the Assembly.

Dr. Paterson's remarks were illustrated by a number of pleasing demonstrations, some of which are illustrated in the accompany pictures. An effective comparison was made between the appearance of a room lighted only by a carbon filament lamp and the same room lighted by fluorescent tubes of similar consumption. The effect of various fittings, direct and indirect, was also shown—the change in fittings being very slickly accomplished by Mr. W. R. Stevens and his assistant, who whisked them up through a hole in the ceiling whilst the stage was temporarily darkened.

Another interesting demonstration showed the room illuminated entirely by the coloured light from fluorescent paint on walls and ceilings, etc.—irradiated by an ultra-violet lamp—though it was

(Continued an page 78)

Fig. 2. The Rt. Hon. Lord Woolton, Minister of Reconstruction, and Mr. C. F. Dickson, Chairman of the Council of E.L.M.A.

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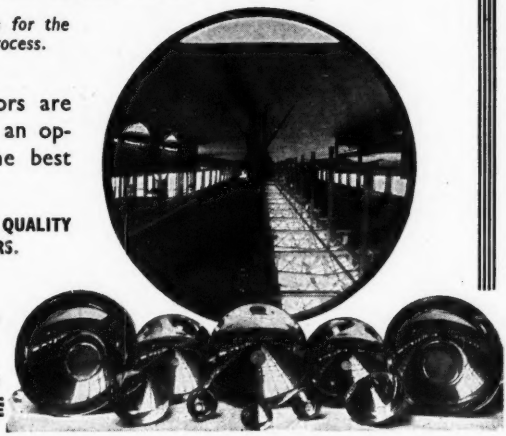

I.P.8. P.13885

Recommended Practice for Lighting Schools, Offices and Factories

Three illustrated pamphlets from the United States, recently reissued, outlining "American Recommended Practice" for the lighting of schools, offices, and factories, are of timely interest. The last two are issued by the Illuminating Engineering Society (U.S.A.), the first, dealing with schools, jointly by the I.E.S. and the American Institute of Architects. In all cases tables of values of illumination, (as in the British "I.E.S. Code") are given, but this is only a small part of the contents which is mainly descriptive and is aided by numerous illustrations of actual installations. The three pamphlets deal essentially with artificial lighting, though the "Recommended Practice of School Lighting" contains a section on natural lighting, on which hints on the design of schoolrooms, window space, etc., are given. No specific recommendation in regard to daylight factor is made.

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(Continued from page 76)

explained that this method of lighting was relatively inefficient.

Incidentally, the display of a diagram illustrating the part to be played by fluorescent lighting in making good deficiencies in natural lighting was in itself a striking demonstration of the utility of fluorescent effects; the line-work, executed on cardboard in fluorescent paint and irradiated by a concealed source of ultra-violet, showed up very vividly. Apart from the ease with which effects in colour can thus be secured, the method has the great advantage that a picture can be shown to an audience when (as in this case) the use of a lantern would be an awkward proposition.

Mr. Charles F. Dickson, in thanking Dr. Paterson for his address, pointed out that the electric lamp industry, whilst only one section in the complicated jig-saw puzzle of Lord Woolton's gigantic overall task, is in itself a big item. He recalled that a battleship used upwards of 14,000 lamps of great variety, an aeroplane over 100 lamps of various types, and even a tank as many as twenty lamps, so that when the ground installations at aerodromes, etc., are taken into consideration the actual war operations call for the design and production of literally thousands of types of special lamps. In addition, of course, the use of lamps in factories engaged on war work reaches a vast total.

Turning to the future, he foresaw that, in connection with the task of reconstruction there might be 5,000,000 new homes to be lighted, 4,000,000 old premises to be brought up to date, 1,000,000 retail premises to be illuminated, and some 50,000 miles of streets to be lighted.

Mr. Dickson drew attention to the work of the various organisations interested in this effort, and laid stress on one drawback: the large number of different ratings of lamps in general use, estimated at about 13,000, which could be greatly simplified by standardisation. He recalled the work of the E.L.M.A. Lighting Service Bureau, which has now been in existence for twenty years and has done much valuable public service. In conclusion, Mr. Dickson presented the "City of Light" (Fig. 4) as a foretaste of lighting in the future.

Lord Woolton, after expressing his interest in Dr. Paterson's demonstrations, said that some of those present might well wonder whether the time would not come when light would be available without the necessity of producing any electricity at all! Dr. Paterson had

Fig. 3. The two Demonstration Rooms used to illustrate Dr. Paterson's address. On the left is a carbon filament lamp using the same amount of current as the two 2-ft. warm-tinted fluorescent lamps in the fitting in the room on the right.

shown clearly what could be done with electricity to brighten the lights of the homes of people in this country. Our people would want a constantly improving standard of light; he believed they would be prepared to labour for it and to work hard. He expressed his interest in what had been said by the chairman in regard to co-operation between different bodies and the advantages of standardisation, and referred to the desirability of uniformity in connection with domestic electrical equipment. Light was the enemy of dark, and electricity ought to be the killer of drudgery. (However, he made no comparisons between gas and electricity—there was room for both.) In conclusion, Lord Woolton paid tribute to what scientific research had accomplished in the electrical industry during the war. The industry had served the nation with great distinction, and during this war the scientists had led the world.

Fig. 4. The "City of Light" used by Mr. Dickson as a foretaste of the future of lighting.

One of these days-

—you will need this

BTH Catalogue ***(published 1939)***

THERE may be very little wrong with the street lighting equipment for which you are responsible. But, little or much, it seems a pity to leave everything to the last moment.

At present we are fully engaged on work connected with the war effort. When the proper time comes, we shall be in a position to offer more than mere paper and ink. Our LIGHTING ADVISORY SERVICE — backed by BTH Research and all the resources of a great company manufacturing *quality* street lighting equipment — will be freely at your disposal.

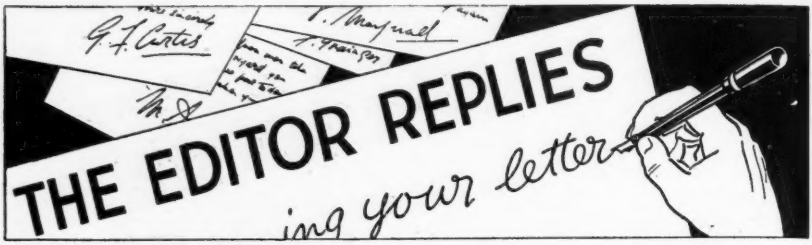
MAZDA LAMPS

B T-H

MAZDALUX Street Lighting EQUIPMENT

M.4027

MADE BY THE BRITISH THOMSON-HOUSTON CO. LTD., CROWN HOUSE, ALDWYCH, LONDON, W.C.2



My discussion of the aim to be pursued in developing a **Code of Lighting** in last issue (April, 1944, p. 58) has led to some comments. It seems to be generally agreed that in practice one must be guided to some extent by what is *practicable*. A good deal depends, however, on the intepretation of the word "Code." It is only within recent years that this term has been applied to the I.E.S. values, previously described as "Recommended Values of Illumination." One may well recommend things that one cannot codify.

This applies even more strongly when one turns from values of illumination to the nature of the lighting. How far should *the means* of getting certain lighting conditions, as well as the quality or nature of the lighting to be aimed at, be prescribed? This is a problem still to be tackled in connection with the I.E.S. Code. In the meantime it may be noted that the fully illustrated American "Recommendations," which are the subject of brief reference elsewhere (see p. 77), are definitely descriptive and "instructional" as well as prescribing conditions to be met.

Reverting to Mr. Carne's recent I.E.S. paper, which raised the fundamental question how far specification of lighting in the home should be determined by **purely economic factors,** my attention has been drawn to some pertinent statistics in the daily Press. In an analysis of national income and expenditure the inference is drawn that the average consumer spends 4s. 2d. on alcohol and tobacco (as against 3s. 9d. in 1942) for every £1 of personal expenditure.

This certainly seems to suggest some margin for expenditure on lighting—but it may be doubted whether it applies to the class we are considering, i.e., the small wage earner with heavy domestic responsibilities. More applicable in this case is the published budget of a soldier's wife, who, out of a total weekly expenditure of £3 14s. 6d., spent nearly 7s. on coal and gas and only 1s. on lighting—a close confirmation of Mr. Carne's estimate. [The rent in this case was 16s. a week, so that the estimate amongst the smaller wage-earners' expenditure on light, which forms about 5 per cent. of the rent, is apparently not far out.] Still, whilst admitting that the budget as a whole seems reasonable, one cannot help feeling concerned that **the smallest item of all,** out of a list of fourteen necessaries, should be on **lighting**—even in the case of those who have certainly no "money to burn" it would seem lighting might be appraised a little more highly.

It is reported that in **Liverpool** a concession has been gained in regard to **street lighting.** In the central square mile of the city an illumination ten times the value of "starlight" (0.0002 ft.c.), controlled by a master-switch, is to be provided. This is about the value of the local increase suggested as reasonable in the I.E.S. "Aids to Movement" report. It would not be surprising if the first step towards a return to normal conditions involved a more general concession on these lines. True, the

higher illumination granted, 0.002 ft.c., is still only about one-tenth of moonlight—but nevertheless it is an increase well worth having.

I notice, by the way, a lament that the black-out has imposed considerable hardship on farmers and fruit growers—as the customary **lighting of bonfires** to combat the **recent frosts** is not permissible. Growers, it has been urged, would gladly have faced the possible risk of damage by hostile action as compared with certain damage by the weather—but, of course, this is not the only factor to be considered.

From time to time I have instances brought to my notice of the vast **loss of light through neglect** of lamps and fittings, which, however regrettable, is almost inevitable in present circumstances. The railways, with their shortage of staff, are sinners and sufferers in this respect. One occasionally gets instructive glimpses of the effect of accumulated dust—for example on escalator fittings furnishing indirect lighting, which are naturally highly sensitive to such deterioration.

A particularly instructive example was afforded by the long line of **lamps in opal globes** lighting the platform of a tube station. I was fortunate in happening to be present when the process of cleaning was half completed. The difference in appearance of the cleaned and untreated fittings was a revelation—certainly the improvement was enough to enable one to read the text of a *Times* crossword puzzle which could not previously be done. Incidentally, one or two distant lights were temporarily bereft of globes. However slight the effect on visibility may be, I think that even the most convinced disciple of Bordoni must have admitted that the appearance of the bare lamps, amidst their screened neighbours, was the reverse of pleasing.

Occasionally one still receives **examples of gadgets** that deserve notice; such arrivals, now much less common than in pre-war days, are always welcome. I take the opportunity of recording a pleasing little device sent me by Paymaster-Captain Robert R. Hoare, R.N., which enables any emblem or device to be completely sealed in between glass plates so that it is entirely protected against effects of dust, and necessary maintenance is thus reduced to an absolute minimum.

Lighting and Safety: A B.T.H. Display

The adjacent picture shows a display arranged by B.T.H. lighting engineers for a recent exhibition organised in the provinces by the Royal Society for the Prevention of Accidents. The effect of glare from unscreened lamps, in making it impossible to read notices is strikingly demonstrated.

Reviews of Books

Fluorescent Lighting, by A. D. S. Atkinson (Geo. Newnes, Ltd., London, 1944; pp. 144; figs. 84. Price 12s. 6d.)

A British book dealing with this subject has been long overdue. As Mr. W. J. Jones assumes in his foreword to this volume the main role of fluorescent lighting at present is industry, but it is likely to be much more widely used in the future. In the meantime the unusual character of the lamp suggests various special fields of application besides involving departures in technique. Mr. Atkinson's work is therefore timely. The first three chapters are in a sense introductory as they deal with ultra-violet radiation, and sources and applications of fluorescence. These lead to a description of the tubular fluorescent lamp (Chapter IV) and it is here that the departure from ordinary lighting with incandescent sources becomes evident. Apart from the additional accessories (starting switches, chokes, etc.) the special qualities of this lamp, not only its "daylight" quality, low brightness and efficiency, but also such factors as radio interference, stroboscopic effect and temperature variation require consideration. At the end of this chapter are notes on several unusual points, such as working of lamps in series or on D.C., and there are some useful hints on servicing. The next chapter deals in a general manner with fittings. Practical hints on the choice of reflectors are given, though one seems to miss here specimens of polar curves and the discussion of the attainable magnifying power, by reflection, of the downward candle-power. The next chapter on illumination design data should be very helpful to designers (who will be relieved to find that under most practicable working conditions the illumination-curves in iso-foot-candle diagrams are roughly circular). Tables are presented enabling local values of illumination to be determined, and data in regard to performance of fittings, utilisation factors and spacing are given. Some attention is also devoted to shadow-effects, and various alternative methods of mounting tubes are discussed. The concluding chapters deal with applications and are illustrated by numerous photographs of actual installations mainly industrial, though other opportunities, e.g., in schools, offices, and homes are in conclusion briefly surveyed.

The following has also been received and will be reviewed in due course:—

The Application of Radiant Heat to Metal Finishing, by J. H. Nelson and H. Silman. (Chapman and Hall, London, 1944; pp. 79; figs. 37. Price 8s. 6d. net.)

Lighting Reconstruction Pamphlets

It will be recalled that the I.E.S. has recently issued the first three of the series of Lighting Reconstruction pamphlets* dealing respectively with "Principles of Good Lighting," "The Lighting of Public Buildings," and "The Lighting of Schools."

A fourth pamphlet entitled "Natural Lighting" has now made its appearance. This deals with access of daylight into buildings as a feature of reconstruction. Methods of assessing daylight are illustrated, the characteristics of good natural lighting are explained, and means of securing these in buildings of the future and in town planning schemes are discussed.

Orders may now be placed for this fourth pamphlet, which is issued at the same price as the preceding ones (1s. per single copy, 9s. per dozen or 60s. per 100—post free).

* Light and Lighting, April, 1944; p. 42.